

Washington State Department of Transportation

Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using TerraSync™ 5.10 software

Version 1.0

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Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using TerraSync™ 5.10 software¹

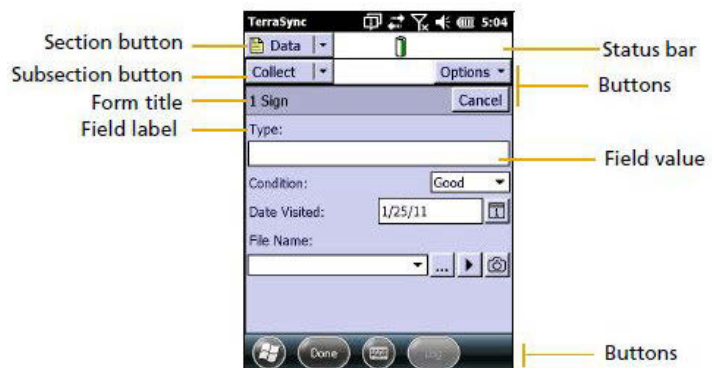
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1. Getting Started

- Connect the antenna to the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld (GeoXT). Turn on the GeoXT. The Power button is the green button below the screen. If it won't start up, see Troubleshooting ([Section 6](#)).
- Tap "GNSS" in the lower right corner of the screen to open TerraSync™ 5.10 software (TerraSync).

2. TerraSync™ 5.10 Basics

- There are 5 sections to the software: Map, Data, Navigation, Status, and Setup.
- The Section button in the upper left corner of the screen is used to move between the different sections and also used to exit the software.
- One of the 5 sections is always active and visible. The Section button shows the section that is currently active. You can move between sections at any time without closing any open forms or screens.
- Some sections have subsections. The Subsection list button is located below the Section button.

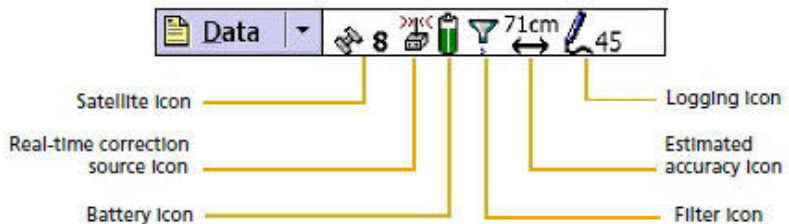


3. Collecting Data

- Connect TerraSync to the GNSS Receiver:** The first thing you need to do after starting up TerraSync is to connect to the GNSS receiver. Tap the Section button, then tap Setup. In the Setup screen, tap the GNSS button in the upper right corner of the screen. Once connected, the GNSS receiver will begin to track visible satellites and calculate the receiver's current position. If you're already connected to the GNSS receiver and you tap the GNSS button, you'll be asked "Are you sure you want to disconnect from the GNSS receiver?"

¹ Except where noted, information about TerraSync™ 5.10 software is from the [TerraSync Software Getting Started Guide](#) (February 2011, Version 5.10, Revision A).


- b. **Status Bar:** The status bar at the top of the screen can be used to see how many satellites are being tracked, whether or not real-time correction input is being picked up, whether data is being logged, and the battery status.







- c. **Create a New File:** Before starting the data collection session, you need to create a new data file. (If you will be adding data to an existing file, see [Section 3q](#).) Use the Section button to move to the Data screen. The New File option should come up automatically on the Subsection button. If not, tap the Subsection button and select New. A default name appears automatically for the file name. You can use this or rename the file. To rename the file, use the stylus to highlight the entire name, then type the new name over the old one. Use the drop-down list to select the correct data dictionary. GNSS/GPS support staff have created customized data dictionaries for only a few of WSDOT's Environmental Services Office (ESO) programs; they should be named to identify the owners. If you don't have a customized data dictionary, use Generic. You may need to scroll down the page in order to see the data dictionary drop-down list or hide the keyboard. Tap the Create button in the lower left corner of the screen. The "Confirm Antenna Height" window opens. If necessary, update the information based on your setup. The optimal method for collecting data is with the external Tornado™ antenna on its range-pole. In this case, the antenna height is 6.550 feet, the antenna type is Tornado™, and the measurement is to the bottom of the antenna mount. If you chose not to use the external antenna, then select "GeoXT™ 6000 Internal," and enter the height of the unit above the ground. These values are used by the GNSS receiver in its calculations.

WARNING: You may get the message "Laser failed to open. Check Sensor Port settings, and Comms Status for available ports." This is because the unit is set up to connect with a laser rangefinder, but it's not finding one. Tap OK to continue.

- d. **Choose a Feature to Collect:** The Collect Features screen appears after you hit the Create button. This screen appears different depending on whether you chose to use a personalized data dictionary or the generic data dictionary.
- **Personalized Data Dictionary:** The Collect Features screen shows the various features available in the data dictionary you selected (as well as the features in the generic data dictionary: Point_generic, Line_generic, Area_generic). Choose the type of feature you want to collect and tap the Create button in the lower left corner of the screen. The unit starts logging positions as soon as you create a new feature, so be sure to be located on the point you want to collect or at the starting point of any line or area you want to collect before you tap the Create button, or see [Section 3h](#), Log Later. The Log Later option is especially useful when collecting line or area data, which requires you to move along a line or walk a perimeter. If the unit is already paused when you tap the

Create button (you'll see the Pause icon),  you'll need to tap Log to start collecting data.

- **Generic Data Dictionary:** The Collect Features screen consists of three big buttons, one for each of the three available feature types: Point_generic, Line_generic, Area_generic. When you tap one of the buttons, data collection begins immediately; you don't need to press the Create button. The unit starts logging positions as soon as you create a new feature, so be sure to be located on the point you want to collect or at the starting point of any line or area you want to collect before you tap the Create button (or see [Section 3h](#), Log Later). The Log Later option is especially useful when collecting line or area data, which requires you to move along a line or walk a perimeter. If the unit is already paused when you start data collection (you'll see the Pause icon), you'll need to tap Log to start collecting data.
- e. **Collecting Point Features:** After you've created a point feature, the attribute entry form appears. Record the attributes for the point. To finish data entry on a field, select another field. When selecting from a drop-down list, the fields change automatically after a selection. Depending on the data dictionary used, there may be a scroll bar on the right side of the screen to access more attribute fields. When you're logging GNSS positions, the logging icon (which looks like a bulls-eye)  appears. The number beside the icon indicates how many positions have been logged. After you've collected enough positions for your point (at least 10 positions), tap Done to close the form and stop logging data for that point. You will be asked to confirm that you want to close the current feature. If you are finished, tap OK; if you want to continue collecting more data, tap Cancel. If you do tap Cancel, you may need to tap Resume to continue collecting data. After tapping OK, you'll be returned to the Collect Features screen. During data collection, tap Cancel if you want to discard a feature. You'll be asked to confirm and will then be returned to the Collect Features screen.
- f. **Collecting Line Features:** *(This section describes the streaming method of collecting a line. If you're interested in collecting a line using averaged vertices, see [Section 3n](#).)* After creating a line feature in the Collect Features screen, the attribute entry form appears. Record the attributes for the line. To finish data entry on a field, select another field. When selecting from a drop-down list, the fields change automatically after a selection. Depending on the data dictionary used, there may be a scroll bar on the right side of the screen to access more attribute fields. When you're logging GNSS positions, the logging icon (which looks like a pencil)  appears. The number beside the icon indicates how many positions have been logged. Move along the line you need to collect. At its end, tap Done to close the form and stop logging data. You will be asked to confirm that you want to close the current feature. If you're finished, tap OK; if you want to continue collecting more data, tap Cancel. If you do tap Cancel, you may need to tap Resume to continue collecting data. After tapping OK, you'll be returned to the Collect Features screen. During data collection, tap Cancel if you want to discard a feature. You'll be asked to confirm and will then be returned to the Collect Features screen.


- g. **Collecting Polygon Features:** *(This section describes the streaming method of collecting a polygon. If you're interested in collecting a polygon using averaged vertices, see [Section 3n](#).)* When collecting a polygon feature, the first and last GNSS positions are automatically joined together to close the area, so you don't need to travel back to your starting point. After creating an area feature in the Collect Features screen, the attribute entry form appears. Record the attributes for the area. To finish data entry on a field, select another field. When selecting from a drop-down list, the fields change automatically after a selection. Depending on the data dictionary used, there may be a scroll bar on the right side of the screen to access more attribute fields. When you're logging GNSS positions, the logging icon  (which looks like a pencil) appears. The number beside the icon indicates how many positions have been logged. Move along the perimeter of the area you need to collect. At its end, tap Done to close the form and stop logging data. You will be asked to confirm that you want to close the current feature. If you are finished, tap OK; if you want to continue collecting more data, tap Cancel. If you do tap Cancel, you may need to tap Resume to continue collecting data. After tapping OK, you'll be returned to the Collect Features screen. During data collection, tap Cancel if you want to discard a feature. You'll be asked to confirm and will then be returned to the Collect Features screen.
- h. **Log Later:** The Log Later option is especially useful when collecting line or area data, which requires you to move along a line or walk a perimeter. It gives you a chance to enter attribute data before moving from your starting point. Before creating the feature you want to map, tap Options, then Log Later. When you do create a feature, the attribute entry form will appear and the  Pause icon will flash. Record the attributes of the point, line, or area, then move to the point you want to map or the start of the line or area. Once in position, tap the Log button, which is in the lower right corner of the screen. The unit will now start logging data. At the end of the feature, tap OK. (The Log Later option will be retained for each following feature until the Log Now option is tapped instead.)
- i. **Pause/Resume:** You can pause logging at any time by tapping the Pause button at the bottom of the screen. To resume logging, tap the Resume button at the bottom of the screen. **This can be useful for getting around obstacles when you're collecting a line or polygon in streaming mode.**
- Pause can also be useful for making sharp corners. Hit Pause at the point where you make a sharp turn. When you hit Resume, a new GNSS position is immediately logged.
- It's been reported that you may not be able to resume immediately if there is poor satellite geometry, i.e., the unit will not respond to pressing the Resume button. Check to make sure positions are being logged whenever you hit the Resume button. Once the satellite situation improves, the unit should respond.
- j. **Repeating Features:** When you use the Repeat option, attribute values are copied from the last recorded feature of the same type, so you don't have to re-enter

values for all attributes. Just check that each attribute value is correct for the feature; change only those that are different.


Tap on Options in the Collect Features screen and select Repeat. When Repeat is selected, a check mark appears beside it.

The next time you create a feature of the same type, the attribute values that appear in the attribute entry form will be those of the last recorded feature of that type. Edit them if necessary. Continue until you want to turn off Repeat mode.

To turn off Repeat mode, tap Options, then select Repeat. The check mark disappears.

- k. **Nesting Points:** You can collect point features while you're collecting line or polygon features by using the Nest option. First, in the Collect Features screen, tap Options and select Log Later. Create a line or polygon feature. Collect the line or polygon as normal; however, when you reach the first point feature you want to collect, tap Pause. Tap Options, then select Nest and the point feature you want to collect. Tap Log to collect the point feature. Once you have enough positions for the point, tap Done to return to the line or polygon attribute entry form. Tap Resume and continue to walk the line or polygon. When you reach the next point feature of interest, tap Pause and repeat the steps outlined above. At the end of the line or polygon feature, tap Done to return to the Collect Features screen.
- l. **Viewing a Map of Your Data:** You can view a map of the data you're collecting while you're actually collecting features. Use the Section button to go to the Map screen. The first time you view your map, you may need to hit the Zoom to  Extent button at the bottom of the Map screen. You can Zoom In, Zoom Out, and Pan. These tools are accessed through the Subsection button. When you want to return to the Data collection screen, tap the Section button and select Data.
- m. **Logging Intervals:** The logging intervals default to those set in the data dictionary. If you need to change the interval, tap on Options in the Collect Features screen or the attribute entry form. Logging Interval is one of the options. You can choose between 1 second and 5 seconds.
- n. **Averaged Vertices:** A line or polygon feature consists of a number of positions joined in sequence from the first position logged to the last. Each position represents a vertex of the line or polygon. For a more accurate recording of these features, you can record several positions at each vertex, then these positions are averaged to calculate the vertex position. You choose when to collect a vertex rather than automatically collecting one every few seconds.

To capture a line or polygon using averaged vertices, the GNSS receiver will be in Pause mode most of the time, except when you're collecting a vertex. In the Collect Features screen, tap Options then Log Later. Then tap Options again and set the Logging Interval to 1 second. Create a line or polygon feature. When the attribute entry form appears, fill it in. To create a vertex, tap Options, then New Vertex. The screen will tell you which vertex in the feature is being collected and tell you to "Remain stationary." Logging of positions begins **immediately**. Stand still just as though you were collecting a point feature. The logging icon in the status bar

changes to an animated circle zooming in. The number beside it  shows the number of positions logged for this vertex.

When you have logged as many positions as you need for this vertex (at least 10), tap Done to stop collecting the vertex. (If you need to cancel an averaged vertex, hit Cancel instead of Done.) Logging is again paused. Walk to the next vertex and repeat. When you've completed the line or polygon, tap Done as normal to stop logging data and return to the Collect Features screen.

- o. **Exit out of Data Collection:** To close the file once you're done logging data, tap the Close button in the lower right corner of the screen. You will be asked to confirm that you want to close the file. **WARNING:** Per Trimble®, failure to close files may result in corrupt data.
- p. **Reviewing Data:** To review data in an existing file, in the Data screen use the Subsection button to select Existing File. Select the file containing the data you're interested in and tap the Open button. The "Confirm Antenna Height" window opens. After the "Confirm Antenna Height" window, you may get the message "Laser failed to open...." Tap OK to continue. A list of the features in that file appears. By selecting a particular feature in that file, you can find out how many positions were collected, the length of a line, and the perimeter and area of a polygon. This information is displayed at the bottom of the screen. Area should be displayed in acres; however, there appears to be a size threshold *below which* area is displayed in square feet and *above which* it really does appear as acres. You can also view a map of your data by using the Section button to go to the Map screen. After reviewing the data, tap the Close button in the lower right corner of the Data screen.
- q. **Using an Existing File:** If you want to add data to or edit data in an existing file, select the Existing File option in the Data section. Then you can select from a list of data files. Tap Open to open a file. The "Confirm Antenna Height" window opens. After the "Confirm Antenna Height" window you may get the message "Laser failed to open..." Tap OK to continue. The Update Features option opens automatically. This option allows you to update attributes, offsets, and GNSS positions or to delete features. To update a feature, highlight it in the Choose Features list and tap Begin. To delete a feature, highlight it, then tap Options and select Delete. If you want to add more features to the existing file, switch from the Update Features option to the Collect Features option in the subsection list. The Collect Features screen appears (as described in [Section 3d](#)) and data collection can continue as usual. Because of the way in which GNSS times are stored, you can't log new features to a file that is more than a week old.
- r. **Closing up TerraSync™:** Once you're finished with data collection and want to turn everything off, go to the Setup screen and tap the GNSS button. You'll be asked "Are you sure you want to disconnect from the GNSS receiver?" Tap Yes. To close TerraSync, use the Section button to select Exit. **WARNING:** Per Trimble®, failure to disconnect from the GNSS receiver and close TerraSync may result in corrupt data.

- s. **Turning off the GeoXT™ 6000:** Turn off the unit by pressing the green Power button below the screen.

4. Data Collection Best Practices

Trimble® has come up with some new data collection best practices to work with its latest hardware and software improvements ([Trimble Mapping and GIS Webinar Series: Mapping and GIS GPS Data Collection Best Practices](#), 12/16/2010).

- a. Keep the GNSS antenna correctly oriented to the sky.
 - If you aim the antenna at the ground, it will pick up reflected signals and degrade accuracy. This includes the time spent walking between features.
 - Consider turning off the device rather than walking with the antenna pointing down.
- b. Collect good quality GNSS measurements between features (30–60 seconds minimum). This doesn't mean actually collecting a point or other feature, but having TerraSync connected to the GNSS receiver and having the antenna correctly oriented to the sky while standing or walking in the open. For example:
 - Collect good measurements in the open while walking toward the “tough” feature.
 - Collect the feature.
 - Collect more good measurements while walking away toward the open.

Why? Good data before/after the feature helps the postprocessing software to smooth out the data collected at the feature where conditions aren't optimal.

- c. How long should a point feature be logged in difficult conditions? In difficult conditions, or if the accuracy is less than desirable, log for 15 or 30 seconds, or even longer if necessary.
- d. Use an external antenna in tough environments.
 - It's easier to get above your body.
 - The signal reception is stronger.
 - There are fewer reflected signals.

5. Miscellaneous

Most of the information in this section is from the [Trimble GeoExplorer 6000 Series Datasheet](#), 5/7/2012. Additional information is from colleagues and vendors.

- a. **Weather Issues:** The GeoXTs are designed to be water resistant, dustproof, and shock resistant. They can be used between -4 and 140 degrees Fahrenheit and can be stored between -22 and 158 degrees Fahrenheit. Despite their ruggedness, there are a few things to keep in mind.
 - In hot weather (~ > 90 degrees F), the screen protectors seem to mark up more easily. This could make it more difficult to see the screen. Notify GNSS/GPS support staff if the screen protectors need to be changed.
 - Avoid using the GNSS receiver in weather that would allow snow or ice to build up on the antenna. This could block the GNSS satellite signals.

- Also avoid using the GNSS receiver when lightning is imminent; the antenna makes an excellent **lightning rod**.
- b. **Heavy Canopy:** Heavy canopy can block radio signals from the GNSS satellites. The new Floodlight Technology should help this situation. Some procedural changes may also help improve data collection in this adverse environment. Reducing the logging interval while collecting lines and areas can reduce data loss; see [Section 3m](#) for information on how to adjust logging intervals. Another idea is averaged vertices (see [Section 3n](#)).

6. Troubleshooting

Most of the information in this section is from the [GeoExplorer 6000 Series User Guide](#) (February 2011, Version 1.00, Revision A). Additional information is from colleagues and vendors.

- a. **Suspend Mode:** The unit may go into Suspend mode when it has been idle for a specified period of time (3 minutes by default). This is a low-power mode that makes the unit appear to be turned off. If the screen suddenly goes blank, before jumping straight to a reset (see [Section 6d](#)), try pressing the Power button first in case the unit is just sleeping.
- b. **Nonresponsive Screen:** If the unit stops responding to the stylus, here are some things to try:
 - Incorrect alignment: The touch screen may be incorrectly aligned. If this happens, tap the Windows² icon in the lower left corner of the screen. Go to Settings, System, Screen. Tap the Align Screen button and follow the instructions.
 - Cold weather: Touch screens can be sensitive to cold weather (cold weather isn't defined, unfortunately). Apparently the plastic screen covers can cause a problem in these situations. Try taking the screen protector off.
 - Locked screen: The main screen has an option to lock the screen. To unlock the screen, slide the Unlock icon.
 - Reset (see below).
- c. **GNSS Positions Not Being Collected:** This situation has been experienced a few times. GNSS data was being collected just fine and then after moving to a new location, it was unable to collect positions. The satellites, PDOP, and estimated accuracy looked fine, so data collection shouldn't have been a problem. The logging icon (bull's eye for points, pencil for lines and polygons) was present, but no positions were being logged. **The solution was to close out of the file and open a new one.**
- d. **Resetting the Unit:** This may be the solution if the unit won't turn on, if the screen goes blank, or if the unit becomes unresponsive to the stylus. Try a soft reset first. If

² Windows is a registered trademark of Microsoft Corporation in the United States and other countries. *Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using TerraSync™ 5.10 software* is an independent publication and is not affiliated with, nor has it been authorized, sponsored, or otherwise approved by, Microsoft Corporation.

that doesn't work, then try a hard reset. Occasionally, it may take a few tries to reset the unit.

- **Soft Reset:** Press the Power button for about 1 second. The Power menu appears. Use the stylus to tap Reset. It will probably take the unit a few minutes to fully wake up. A soft reset will retain all the settings and device data that you have previously saved on the unit. The unit saves any unsaved data, closes all applications, and then restarts.
 - **Hard Reset:** Perform a hard reset only if a soft reset doesn't resolve the problem. Press and hold the Power button for 4 seconds—the Reset option in the Power menu starts counting down. Release the Power button when the power is turned off. **A hard reset retains settings and data that you have previously saved. However, any unsaved data may be lost.**
- e. **Dead Battery:** If the screen goes blank and the unit isn't in Suspend mode, and a reset doesn't work, maybe the battery is depleted. Try letting the unit recharge for a while. A full charge may take up to 5 hours.

7. References

GeoExplorer® 6000 Series User Guide, Version 1.00, Revision A, February 2011:

✓ http://tienda.eptisa.com/archivos_web/file/geoexplorer%206000/manual%20usuario/geoexplorer_6000_series_manual_usuario_ingles.pdf

TerraSync™ Software Getting Started Guide, 2/18/2011:

✓ http://trl.trimble.com/docushare/dsweb/Get/Document-529465/TerraSync_GSG_v510_RevA_ENG.pdf

Trimble® GeoExplorer® 6000 Series Datasheet, 5/7/2012:

✓ http://trl.trimble.com/docushare/dsweb/get/document-597676/022501-285a_geo%20series%206000_ds_0212_mgis_lr_nc.pdf

Trimble® Mapping and GIS Webinar Series: Mapping and GIS GPS Data Collection Best Practices, 12/16/2010:

✓ <http://www.trimble.com/mappinggis/webinars.aspx>

8. Acronyms

ESO	WSDOT Environmental Services Office
GeoXT	Trimble® GeoExplorer® 6000 Series GeoXT™ handheld
GIS	Geographic Information System
GLONASS	GLObal NAVigation Satellite System
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
PDOP	Precision Dilution of Position
TerraSync	TerraSync™ 5.10 software